

was at Toulouse Observatory for twelve years under M. Baillaud, and carried out a successful programme of stellar photography with the large reflector. He also continued his mathematical researches, obtaining the doctor's degree for a thesis on hyperabelian groups, and helping in the editing of the works of Hermite. He took a large share in the photography of the Toulouse zone of the astrographic catalogue, in the Eros programme of 1900, and observed the total solar eclipses of 1900 and 1905 from Elche and Guelma.

In 1907 M. Bourget became director of the Marseilles Observatory, when he introduced the seismograph, the prism-astrolabe for time determination, and the reception of wireless signals from the Eiffel Tower. He also studied with MM. Fabry and Buisson the internal movements in the Orion nebula. He later introduced the Marseilles Circulars and the *Journal des Observateurs*, which have proved very serviceable for the distribution of information concerning comets and minor planets.

A. C. D. C.

THE death of Lieut.-Col. P. G. VON DONOP, which occurred on November 7, at the age of

seventy years, is recorded in *Engineering* of November 11. He obtained a commission in the Royal Engineers in 1871, and in 1899 was appointed Inspecting Officer of Railways under the Board of Trade. His name was well known in connection with inquiries into railway accidents.

THE death of Prof. CARLTON JOHN LAMBERT on November 6 is announced in *Engineering* of November 11. Prof. Lambert was seventy-seven years of age, and for several years was professor of mathematics, physics, and mechanics at the Royal Naval College, Greenwich. He was elected an associate member of the Institution of Naval Architects in 1896.

WE regret to see the announcement of the death on November 16 of PROF. P. THOMPSON, professor of anatomy at Birmingham University, at the age of fifty years.

It is with much regret that we see the announcement of the death, on November 22, at seventy-six years of age, of the distinguished philosopher, M. EMILE BOUTROUX, member of the Institute of France.

Notes.

THE new skull from Rhodesia described by Dr. A. Smith Woodward in last week's *NATURE* was exhibited by him at a meeting of the Zoological Society on November 22. The skull, which was found in the Broken Hill Mine at a depth of 60 ft. below water-level and 90 ft. below ground-level, is in a remarkably fresh state of preservation. It is much broken on the right side and the lower jaw is missing. The brain-case is of modern human type, and the bone not thicker than that of the ordinary European; the capacity, though not yet accurately determined, is clearly above the lower human limit. The orbits are large and square, with pronounced overhanging ridges much extended laterally. The forward position of the foramen magnum indicates that the skull was poised on an upright trunk. The palate is large, but typically human, and adapted to perfect speech. It is remarkable that the teeth are much affected by caries. The lower jaw must have been massive and larger than the Heidelberg jaw. The appearance of flatness of the frontal area suggests a comparison with *Pithecanthropus erectus*. Dr. Smith Woodward was inclined to find the nearest approach to the Rhodesian skull in the Neanderthal type from La Chapelle aux Saints in France. Though markedly modern in regard to the brain-case, in its facial characters, while it is essentially human, it appears to hold a position between the gorilla and Neanderthal man. Fragments of the long bones, both femur and tibia, which have been found indicate that, unlike Neanderthal man, Rhodesian man walked in a perfectly upright posture. Dr. Smith Woodward regarded Rhodesian man as possibly a later development than Neanderthal man, but Prof. Elliot Smith suggested that he might represent a primitive type of which Neanderthal man might be a highly specialised form.

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THE Council of the Institution of Electrical Engineers has elected Lord Southborough to be an honorary member of the institution. Lord Southborough, who is probably better known to men of science as Sir Francis Hopwood, has long been associated with electrical progress in this country, and rendered valuable services to the Institution of Electrical Engineers in connection with the obtaining of a Royal Charter and Royal Patronage, by his enthusiastic help and counsel, and by active co-operation with the charter committee. He is a member of the Board of Control of the National Physical Laboratory, and has been for many years closely associated with the problem of railway electrification.

THE inaugural meeting of the Empire Forestry Association was held in the Guildhall, London, on November 16. The object of the association is to federate in one central organisation societies and individuals interested in the growth, marketing, and utilisation of timber throughout the Empire. The association will publish a Journal, advocating a constructive policy of conservation and development in the various Dominions, Colonies, and India. It will collect and publish facts as to existing forestry conditions and timber requirements of the Empire. A room in the Imperial Institute will be at the disposal of the association for the display of the commercial timbers which are produced in countries under British rule. A Royal charter has been granted to the association. The secretary is Mr. T. S. Corbett, 17 Victoria Street, London, S.W.

THROUGH an advertisement in the *Times*, Prof. F. Soddy issues a warning "against the fraudulent use of a letter written by him referring to tests made by him of a process alleged to make gold."

MR. R. G. BARKER, of the British Dyestuffs Corporation, has been appointed scientific director of the British Launderers' Research Association.

THE *British Medical Journal* announces that the Swedish prize entitled the Berzelius medal has been conferred on Prof. E. Abderhalden, of Halle, for his researches on biochemistry.

At the ordinary scientific meeting of the Chemical Society to be held in the lecture hall of the Institution of Mechanical Engineers, Storey's Gate, on Thursday, December 8, at 8 p.m., Prof. J. W. Gregory will deliver a lecture entitled "The Genesis of Ores."

THE Molteno Institute for Research in Parasitology is to be opened by Earl Buxton at Cambridge on Monday next, November 28, at 3 p.m. The new institute is a gift to the University from Mr. and Mrs. Percy A. Molteno.

THE council of the Royal Meteorological Society has awarded the Symons memorial gold medal for 1922 to Col. Henry George Lyons, F.R.S., for distinguished work in connection with meteorological science. The medal, which is awarded biennially, will be presented at the annual general meeting on January 18 next.

NOTICE is given that applications for the Government grant for scientific investigations for 1922 must be received by, at latest, January 1. They must be made upon forms obtainable from the Clerk to the Government Grant Committee, Royal Society, Burlington House, W.1.

APPLICATIONS for grants from the Andrew Carnegie Research Fund in aid of research work on the metallurgy of iron and steel are now receivable by the council of the Iron and Steel Institute. Application forms may be obtained from the secretary of the institute. They should be completed and sent in before the end of February.

At the meeting of the London Mathematical Society to be held at 5 p.m. on Thursday, December 15, in the rooms of the Royal Astronomical Society, Burlington House, W.1, Mr. J. H. Jeans will deliver a lecture on "The New Dynamics of the Quantum Theory." Members of other societies will be welcome.

THE following were elected officers and members of council of the London Mathematical Society at the annual general meeting held on November 17:—*President*: Mr. H. W. Richmond. *Vice-Presidents*: Mr. J. E. Campbell, Mr. A. L. Dixon, Dr. W. H. Young. *Treasurer*: Dr. A. E. Western. *Secretaries*: Mr. G. H. Hardy, Dr. G. N. Watson. *Other Members of the Council*: Dr. T. J. I'A. Bromwich, Dr. L. N. G. Filon, Dr. H. Hilton, Miss H. P. Hudson, Mr. A. E. Jolliffe, Mr. J. E. Littlewood, Mr. E. A. Milne, Dr. J. W. Nicholson, and Mr. F. B. Pidduck.

At the meeting of the Royal Geographical Society on Monday, November 21, the president announced that Brig.-Gen. the Hon. Charles Bruce has been offered the post of chief of the Mount Everest Expedition for next year, and has accepted the invitation. From an account just received by the society from

Mr. Mallory of his final and successful effort to reach the North Col, 23,000 ft., it is understood that the way from there to the crest of the north-east arête is easy. Whether men suffering from the increasing lassitude which the ascent will produce can prevail against the wind and snow on the last 6000 ft. of that exposed arête is what next year's expedition will have to determine.

THE *Times* announces that the advance party of Mr. V. Stefansson's new Arctic expedition has arrived at its base on Wrangell Island, some 160 miles north of North Cape, Eastern Siberia. The main party of the expedition is expected to leave Nome, Alaska, next March or April. Its chief object is to explore the Beaufort Sea in order to discover if any land exists in that uncharted area. Mr. Stefansson believes that this can best be accomplished by small parties travelling over the ice, depending on seals for food, and thus able to remain for long periods away from the base. Wrangell Island itself has been imperfectly explored by Americans and, in 1914, by the survivors of the *Karluk*, the ship of Mr. Stefansson's former expedition. No further details of the present expedition are yet available.

In a paper read before the Royal Society of Arts on November 9 Mr. D. R. Wilson gave a summary of the work of the Industrial Fatigue Research Board, the activities of which have, unfortunately, been curtailed owing to the demands in the interests of "national economy." The study of industrial fatigue is of quite recent origin. Its effects can be judged in various ways, notably by the rate of output, which follows a well-identified change throughout the working day. In some cases diagrams for hourly output throughout the week also reveal cumulative fatigue, *i.e.* a distinct diminution of efficiency as the week proceeds, and a corresponding improvement after the recuperative pause at the week-end. The effects of climatic conditions, giving rise to seasonal variations in output in certain industries owing to alterations in conditions of temperature, humidity, etc., are also interesting. A noteworthy fact is that, according to researches in the silk-weaving industry, output suffers a 10 per cent. diminution under artificial light as compared with daylight. Such work has a direct bearing on national efficiency and productive power. It is probable that much assumed "slackness" is due to causes outside of the control of the worker. It is a pity that these researches should be limited by lack of support.

At the opening meeting of the Illuminating Engineering Society on November 15 an account of recent progress in connection with illumination was presented by Mr. L. Gaster, who referred to various recent official reports dealing with factory lighting, the effect of kinema lights on the eyesight of actors in studios, and motor headlights, as illustrating the interest now taken by Government Departments in various aspects of illumination. Afterwards a series of short demonstrations of novel applications of artificial light was given. This included several new forms of motor-car headlights, systems of "artificial

daylight," new neon electric lamps used for letter-signs, etc. The last-named exhibit was of considerable scientific interest in view of the novel principle of using neon gas as a luminous medium instead of a filament within a lamp-bulb of the ordinary standard size. Another striking demonstration illustrated the application of ultra-violet rays for the purpose of distinguishing genuine precious stones from spurious ones. Most gems fluoresce under strong ultra-violet light. Not only is the effect different in a genuine gem from that met with in imitations, but it is even possible to discriminate, by means of the difference in the colour of the fluorescence, between gems of the same kind from different districts. It was shown that Indian pearls can be readily distinguished from Japanese pearls by the aid of ultra-violet light, although by ordinary light they can be detected only with great difficulty. Ultra-violet light does not, however, enable "cultured" to be distinguished from ordinary Japanese pearls.

"SCIENTIFIC Men as Citizens" was the subject of an address by Sir Richard Gregory to an open meeting of the Cambridge branch of the National Union of Scientific Workers on November 16. In the address the theme was developed that modern civilisation differs from civilisations of the past, especially in wealth and power, almost entirely as the result of science and its application to human affairs. How comes it that the scientific man, as such, does not occupy a position in the community in any way commensurate with what he has done for modern civilisation? The reason appears to lie in the failure of scientific men as a body to grasp their own significance in the social complex, their failure to take any interest in the relation of their work and its application to the life of the community, their failure to impress their own importance and the importance of their work upon the imagination of the public, upon Governments, and upon leaders in industry. Broadly speaking, modern wealth and industrial expansion are directly due to scientific men, but men of science as such have taken little part in trying as citizens to control the proper uses of the riches with which they have helped to endow the nation. Scientific men should now exert direct influence in the State, and the motto of any organisation or union they may form should be, "The interests of science are the interests of the community, and the interests of the community are the interests of science." Sir Ernest Rutherford, who followed Sir Richard Gregory, said that the difficulty was that scientific men, both by temperament and training, were unfitted for the so-called political world. The remedy was for scientific men to be represented by men educated and trained in science, but who also possessed ability for public affairs or journalism. Prof. A. C. Seward emphasised the need for, and the value of, increased scientific education in schools. Prof. J. Stanley Gardiner, president of the Cambridge branch of the union, occupied the chair at the meeting.

A VERY remarkable kinematograph film, illustrating the method by which the cuckoo disposes of its eggs,

and the subsequent behaviour of the young, was exhibited at the scientific meeting of the Zoological Society on November 8. For some years these matters have formed the subject of very patient and methodical study by Mr. Edgar Chance, and this summer he contrived, after an elaborately worked out plan, to summarise his results with the aid of a kinematographer carefully concealed within a shelter of leaves and bracken. Hitherto it has been the accepted belief that the cuckoo deposited her egg upon the ground and then conveyed it to the nest of her dupe in her beak. This film showed clearly enough that, as a matter of fact, the bird lays the egg within the nest, which, at any rate in the case of meadow-pipits' nests, she leaves tail foremost, apparently to avoid displacing the "run" made by the owners of the nest. As she leaves she takes in her beak one of the eggs of the pipit, and presently eats it. The "planing" down of the cuckoo from a high tree, and the alighting within a few feet of the nest, were most realistically shown. But the most wonderful of the whole series of pictures were those which showed the young cuckoo, though but two days old, blind, and naked, making the most determined efforts to raise its foster-brothers on to its back and up over the edge of the nest, thrusting its lean limbs backwards to assure itself by the sense of touch whether its efforts had succeeded. There was something indescribably diabolical and horrible about the whole of the proceedings. The first attempt failed, the downy, struggling body of the nestling to be ejected being saved from falling over the edge of the nest by a projecting twig. At this juncture the foster-mother returned and, unconcernedly feeding both her own youngster, gasping on the rim of the nest, and the young cuckoo, took both and brooded them. No sooner had she left them for more food than the work of eviction began afresh, and this time was accomplished successfully. Immediately after the only remaining rival was also thrown out.

At a meeting of the Royal Statistical Society on November 15, Sir R. Henry Rew delivered his second presidential address, taking as his subject "The Progress of Agriculture." He pointed out that the total land area of Great Britain is now $56\frac{1}{2}$ million acres, and of the $52\frac{3}{4}$ million acres capable of productive use about 90 per cent. is so utilised in a greater or less degree. This area is not capable of any material extension. The proportion of arable land was 58 per cent. in 1869-78, and is now 48 per cent., but the prevalent belief that the output of British agriculture has declined overlooks the fact that the smaller arable area may, if devoted to other crops, produce a greater amount of food than the larger. By substituting potatoes for wheat, for instance, one-fifth the area would give about as much food. Fruit and vegetables have also largely replaced farm crops, while the extension of cultivation under glass has resulted in a great increase of output per acre. As regards livestock, comparing the ten years 1869-78 with 1912-21, there has been a net gain of about 750,000 beasts. There has also been a progressive and substantial increase in milk production during the past fifty years, the milking

herd having increased by 32 per cent., while the yield per cow has also been greatly increased. At the outbreak of war a larger quantity of food was being produced than at any previous period. During the war there was a setback in food production, the amount of cereal food being increased, but other kinds of food being markedly reduced. Whether the pre-war standard of total output has been regained is regarded as doubtful, but such facts as are accessible point to the conclusion that the output of food has been increased. Indeed, the agricultural land of the country is capable of producing more food, for on a large proportion of it the output is undoubtedly lamentably deficient.

"STATE Aid and the Farmer" forms the subject of an interesting paper contributed by Mr. S. L. Bensusan to the *Fortnightly Review* for September last. At the end of the war agriculture was at the summit of expectation, and the machinery required for the big development foreshadowed by the Prime Minister was gradually assembled. The passing of the Agricultural Act left the farmers under certain obligations to the State and to his employees, and in receipt of guarantees to enable him to face foreign competition in wheat and oats. The general policy of the Minister of Agriculture was to further the development of research, to protect the industry from diseases, to organise the agriculture of each county, and at the same time to make conditions as free as possible to encourage enterprise. But the Agricultural Act is now in large part repealed, and the farmers' position is not an enviable one. Not only have all costs increased, but the farmers have also to contend with the grave difficulties introduced by the Labour Bill and the new hours of labour. Farmers have a deep sense of grievance against the Wages Board, and they tend to take up an attitude towards the farm labourer that will lead to widespread disturbance throughout the rural area. It is of the utmost importance that farmers and labourers should meet in a spirit of justice and right endeavour, and should seek by co-operation to fuse into one the great agricultural interests of the country. The author concludes that "to-day the whole fabric of reconstruction is in ruins," whereas it probably would have been better if the Agricultural Act could have been suspended rather than destroyed, for the Act itself was based on sound principles and carried a promise, not for agriculture alone, but for the whole country.

In a paper in the October issue of the *Quarterly Journal of Forestry* Mr. H. J. Denham directs attention to the fact that in calculating the times of fall of seeds of forest trees it has been the custom to neglect the resistance of the air. In the case of small seeds this leads to results much less than the actual time of fall, which is determined mainly by what is known in physics as the "terminal" or "limiting" velocity when the gravitational acceleration is exactly counterbalanced by the air resistance. The seeds experimented on attained this velocity in the first three metres of fall, and the time taken to fall the next

four metres was observed. For certain species of ash and sumach the limiting velocity was 1.5 metres per second, for a maple 1.25 metres, while for a great many species of pine and cedar it is only about 0.8 metre per second. Seeds provided with a thin lamina frequently spin in falling, and the centrifugal force brought into play flattens the lamina and increases the time of fall. The bearing of the limiting velocity on the dispersal of seeds is obvious, and further research is desirable in the interests of forestry.

WE have received vol. 1, No. 1, issued on October 17, of the *Bulletin of the Hill Museum*, a newly instituted magazine devoted to Lepidoptera, and edited by Messrs. Joicey and Talbot. Great credit is due to Mr. Joicey for establishing this journal, and giving the results of studies carried out in his private museum at Witley to the entomological world. It is only a wealthy man or a public body that is in a position to amass collections on the scale carried out by Mr. Joicey. No apology is needed for this practice, since it is only by means of extensive collections that it is possible to carry out research into many of the problems concerning Lepidoptera. Work on variation and geographical distribution, for example, is very dependent upon access to large numbers of specimens. The appearance of an addition to the already long list of entomological periodicals may cause exclamation in some quarters, but it must be pointed out that most of the existing journals which usually accept papers on Lepidoptera are greatly taxed for space, and the high cost of publication has entailed an inevitable reduction in their pages. The sample issue before us is clearly printed and fully illustrated by twenty-four half-tone plates. Intending subscribers to this magazine should communicate with Mr. G. Talbot, curator, the Hill Museum, Witley, Surrey. The editors will be glad to hear from any societies or institutions desiring to exchange their publications. The subscription price is 30s. per annum post free.

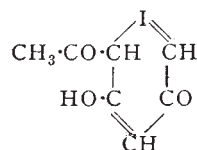
MR. BAILEY WILLIS describes in *Science* (vol. 54, 1921) a new and interesting method of tracing the course of a great earthquake-rift by photography from an aeroplane. One of the most important rifts is that of San Andreas, along which the Californian earthquake of 1906 originated. It has been traced for a distance of about 600 miles, from Humboldt County in northern California to the Mohave Desert in the south of the same State. The fault is an ancient one, and has been the scene of innumerable movements which have given rise to pronounced topographic features. Mr. Willis's photographic survey was carried out during flights from San Francisco to Los Angeles and back, over a distance of about 400 miles. In the northern part, where rainfall is abundant and erosion efficient, there is not much to be seen after fifteen years. Farther south the rift can be traced by the linear arrangement, sometimes for 25 miles, of numerous landslide scars and small ponds. When it enters the desert country, in which the aridity of the climate limits erosion, the signs of the rift become more distinct and continuous.

From an altitude of 12,000 ft. it could be plainly seen like a large empty irrigation canal, stretching away for ten miles to the south until it was lost in the dust haze. Indeed, so permanent are the dislocation features in the desert regions that those produced during the earthquake of 1857 are still plainly visible. Mr. Willis thus concludes that the aeroplane can be used with advantage as a means of rapid geological reconnaissance in mapping large structural features.

In an article on rudder pressures and Airship R38, *Engineering* of November 11 it is pointed out that our information as to the actual forces operating on a ship when its rudder is in use is extremely limited and indefinite. In light structures such as those of airships it is therefore necessary to allow a more generous factor of safety for the structural portions which have to withstand these forces than for any other portion of the structure the straining action of which is more definitely known. It is possible to arrange the weights in an airship relative to the buoyancy, so that the shearing forces and bending moments operating on the structure as a whole may be reduced to very small amounts. If, however, more efficient control is required, and especially for movements in the horizontal plane, larger forces on the structure are involved, and the framing must of necessity be stronger. It is from airships that more definite information as to the actual pressures on rudders and other control surfaces can be obtained,

since the actual pressure at various points can be measured simultaneously without much difficulty. Certain information on this point has already been obtained, but has not yet been published.

In the October issue of the *Journal of the Chemical Society* Prof. J. N. Collie and Miss A. Reilly describe the preparation of a new type of iodine compound. This is obtained by the action of iodine on the barium salt of diacetylacetone, and appears to contain iodine in the ring. The formula attributed to the compound is



On solution in water the iodine atom takes up the elements of water and becomes quinquivalent.

"THE Legacy of Greece," edited by R. W. Livingstone, which is shortly to be published by the Oxford University Press, aims at giving an idea of the debt of the world to Greece in various realms of the spirit and intellect, and of what may still be learned from her. The chapters most likely to appeal to readers of *NATURE* are Biology, by Prof. D'Arcy W. Thompson, Mathematics and Astronomy, by Sir Thomas Heath, Medicine, by Dr. C. Singer, and Philosophy, by Prof. J. Burnet.

Our Astronomical Column.

THE LEONID METEOR SHOWER.—Mr. W. H. Denning records that this display proved rather a feeble one this year, and that very few of the meteors were seen. Miss A. Grace Cook, of Stowmarket, watched the sky for 3½ hours on the very clear, frosty morning of November 11, and recognised six Leonids out of a total number of twenty-five meteors seen. The radiant point was in the usual position at 150+22°. Several other observers maintained a vigilant watch on the same date, but saw very few Leonids, though some brilliant objects were recorded from the minor showers of the period. There were radiant points in Taurus, Auriga, Cancer, and Ursa Major.

A NEW SUGGESTION TO EXPLAIN GEOLOGICAL CLIMATIC CHANGES.—Dr. Harlow Shapley contributes a paper on this subject to the *Journal of Geology*, vol. 29, No. 6. He has lately been observing the seventy variable stars in or near the Orion nebula, finding that they belong to various spectral types, and that their light-curves are peculiar, showing no regular periodicity, no extreme range of variation, and little resemblance to other known light-curves. He supposes that the changes are due to collision or friction with the nebulosity. He then notes that the motion of the sun is nearly straight away from the nebula, and that, assuming the distance as 600 light-years, the sun was in its neighbourhood some 9,000,000 years ago, in which case a variation of from 20 to 80 per cent. of the total light and heat may readily have taken place, more than enough to explain any of the changes postulated by geologists. He makes the further interesting notes that long-exposure spectrograms with the 100-in. reflector show the bright lines

of hydrogen, nebularium, helium, carbon, and nitrogen; and that they also show a faint continuous spectrum in all parts of the nebula. This last fact makes the difference from the spectra of the spiral nebulae one of degree rather than of kind.

STAR CATALOGUES.—There have been extensive additions to published catalogues in recent months. Greenwich catalogues cover the zone 24-32° N. decl., and also the northern circumpolar region. The Astronomer Royal contributed a paper to the meeting of the R.A.S. on November 11, dealing with the proper motions of the latter catalogue. He showed that Drift I. was very strongly indicated, while Drift II. could be traced, but was much less conspicuous, as its apex was not far distant from the region of the catalogue. The Cape Observatory has issued a catalogue of the stars in the Backlund-Hough list, which was drawn up with the idea of covering the sky with a fairly uniform network of stars the places of which were to be well determined. Both Greenwich and Cape observations indicate a surprisingly large correction to the equinox previously employed; this correction has not yet been introduced into the Greenwich catalogues, but the Cape catalogue adopts the value -0.048s., deduced from observations of the sun, Mercury, and Venus. The cause of the correction is obscure; some part of it may be due to the introduction of the travelling-wire method of observing transits.

Washington Observatory has also published a catalogue of fundamental and zodiacal stars. It is particularly desirable to have the latter well observed, since they are employed to fix the positions of the moon and planets.